Vulcan Box Furnace

Air Exchange with Programmable Controls

Owner & Operator's Manual

Models:	*3-550A*	*3-1750A*
230V	*9493985*	*9493990*

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SAFETY ⚠

- Never operate furnace in close proximity to combustible materials or place materials on top of the furnace.
- Caution: To provide continued protection against risk of electric shock, connect to properly grounded outlet only.
- The furnace must be electrically grounded to a three wire electrical outlet or receptacle. The electrical service provided must be a dedicated line of the proper size according to local electrical codes.
- Disconnect the line cord before attempting to service the furnace.
- Do not attempt to service the furnace until you read and understand the service manual. (See Service Manual under Accessories on page 11)
- Do not operate the furnace controls with tongs or other tools; the tongs will damage the control switches.
- Do not use solvents or liquid cleaners on the control panel; they will enter the panel and damage it.
- Do not place firing trays or other hot objects directly in front of the furnace; they will melt the graphic overlay.
- Always verify that the power switch light is off before attempting to load or reach into the furnace chamber with any tools or instruments.
- As a routine working precaution, always wear safety glasses and protective gloves when operating, loading and unloading the furnace.
- The furnace is not equipped with overcurrent protection on the AC primary. In the event that an overcurrent condition occurs, the building's branch circuit overcurrent protection (fuse or circuit breaker) will be the primary means of protection.

⚠ If the furnace is not used in the manner as specified in this manual, the protection provided by the furnace may be impaired.

OSHA AND CALIFORNIA PROPOSITION 65: MUFFLE DUST EXPOSURE

In keeping with the policy of DENTSPLY Neytech to build safe products, comply with all National and State statutes and keep you, the valued customer informed; the services of a Certified Industrial Hygienist firm were employed to test and evaluate the lab operator's exposure to respirable refractory ceramic fiber (RCF) and crystobalite (a form of crystalline silica) present in the furnace muffle.

The findings of this test revealed that levels of exposure during the normal operation of this equipment, as outlined in the operator's manual, were far less than the Permissible Exposure Limit set by the Federal Government.

When it becomes necessary to replace the muffle, the person doing this work is recommended to wear a HEPA filter respirator and protective gloves as a precautionary matter.

Seal used muffle in a plastic bag and dispose of in accordance with local, state and Federal regulations.

Because this product and many similar products on the market today contain crystalline silica and ceramic fibers, it is necessary under the statutes of California Proposition 65 that DENTSPLY Neytech include the following statement:
"This product contains substance(s) known to the State of California to cause cancer."
Material Safety Data Sheets for RCF materials supplied upon request.

Canadian Standards Association (CSA) and TÜV Product Service GS certified.

SYMBOL TABLE

~ - Alternating current	Courant alternatif
I - On (Supply)	Marche (alimentation)
O - Off (Supply)	Arrêt (alimentation)
⚠ - Caution, Hot Surface	Attention, surface chaude
⏚ - Protective Conductor Terminal	Borne de masse, châssis
⚠ - Caution	Attention

FEATURES

- High Performance Hybrid Muffle
  Longer life and more durable than fiber
  Faster heating and faster cooling than firebrick
- Wide operating temperature range
  50°C (122°F) --- 1100°C (2012°F)
- Smooth, low force vertical lift door, with roll back action
  Gives maximum access with minimum vertical space
- Programmable air exchange using preheated makeup air and Venturi exhaust (ASTM D3174).
- Programmable controller with 9 three stage programs (6 segments each) and 1 program with a single temperature hold
- Heavy duty construction with stainless steel front panel
- Delay Start operation that enables the user to program the cycle completion time rather than calculating the start time
- Easy to operate and program with user friendly graphic interface
- Programs linkable for 6 stage operation
- Integrated door safety switch breaks both sides of the power line to muffle
- Wide programmable linear temperature rates both positive and negative (0.1 to 40°C/minute)
- Easy / Lower Cost Muffle Service
  Individual muffle heating plate replacement

APPLICATIONS

- MATERIAL ASHING
- MATERIAL OXIDIZING
- WAX BURNOUT
- MATERIAL HEAT TREATING

INSTALLATION INSTRUCTIONS

UNPACKING CAUTIONS:

Carefully unpack and remove the furnace from its shipping carton. Save the carton and other packing material for future use in transporting the furnace.

The furnace shipping carton contains the following:

- One furnace complete w/ power cord
- Owner's & Operator's Manual
- Ceramic floor tray (shipped in the muffle)
- Muffle shelf (Model 1750 only)

Shipping damage should be reported to the carrier as soon as detected.

LIFTING AND CARRYING:

NOTE: The 1750A models require two people to handle the furnace.

1. Get a firm footing. Keep your feet, shoulder width apart for a stable base.
2. Bend your knees. Don't bend at the waist.
3. Grip the base of the furnace and lift with your legs.
4. Keep the load close to your body and carry the unit to the destination. Keep your back upright during lifting.

INSTALLATION:

1. Remove all packing material from in and around the furnace. The furnace should be located at least 15cm (6") away from walls, shelves, and heat sensitive materials. Open the furnace door and remove the packing material from inside the furnace. NOTE: The furnace front panel may show some discoloration around the muffle due to the calibration and "burn-in cycles" performed at the factory.
2. The furnace should **not** be located directly under shelves and other airflow restrictions.
3. On high voltage, 230V units, connect the power cord to the socket in rear of furnace (this applies to 550A only, 1750A cord is already connected).
4. Positioning the furnace:

a) (Combustion, Burnout or Reaction Processes) Position the furnace under a vent hood or connect the exhaust vent to a ventilation system to prevent exposure to the exhaust fumes.

b) (Heat Treating or Non-Reaction Processes) Position the furnace under a vent hood. The ventilation system should accept a minimal of 25 CFM.

5. Connect the furnace to a power circuit or receptacle with an overcurrent protection (circuit breaker or fuse) rating of 10 Amps. This circuit should only supply the furnace. The 1750 North American model requires a 20A supply (breaker/receptacle).
6. Turn on the green power switch (right-hand side of the control panel) and the LCD display will come on. The light in the green power switch lights when the door is closed and the start key is pressed.
7. At this time, your new furnace should be ready to operate. Please review the OPERATIONS and SETUP & MAINTENANCE sections of the manual before proceeding to select special options.

OPERATIONS

RUNNING A PROGRAM:

The furnace has 9 three stage programs and one single temperature hold program. The furnace is sold with the program parameters set to the factory defaults which can be used for testing. First time operation will require the user to enter their desired parameters into one of these programs.

1. Turn on green power switch (right-hand side of control panel)
   After a short delay for internal testing, the furnace will display approximate room temperature, program time (hours:minutes), and program number. All red LEDs are off. (If any of the LEDs are on, the furnace was already running a program when it was last turned off.)
2. Select or change the program to the desired number by pressing the digit key (1-9) for the desired program followed by the ENTER ↵ key. The display will be updated to show the new program number and its approximate run time.
3. Pressing the green Start S key will start this program. The red LEDs will come on and the time will start to count down. The green power switch will light when the door is closed. The LEDs will turn off as each segment of each stage of the program is completed.
   - During program operation, the total program cycle time is counting down as indicated by the flashing colon.
   - If a program is started when the muffle is already heated, the furnace will heat or cool at the first ramp rate to reach the first temperature segment. The total cycle time will be updated once the start key has been pressed.
   - The program will end by maintaining the last muffle temperature, displaying "Hold", beeping every 3 seconds and flashing the last Temp LED. See information on End Of Program options (point 1) in the "Setup & Maintenance" section if other end of cycle operations are preferred.
4. Pressing the °C / °F key will change the temperature display from °C to °F and back. This key is not active during parameter programming.
5. A short power outage during the operation of a program will not terminate or abort the program unless the muffle temperature drops more than 32°C (58°F). If the power outage occurs when the muffle temperature is close to, or at room temperature (e.g. during Delay Start operation) the furnace will continue the program when power is restored regardless of the temperature drop or the amount of time that has expired.
6. Pressing the Escape ESC key cancels beeping at the end of a program. It also will return the furnace to a display of the current conditions during programming operations.
7. Opening the door during a cycle interrupts power to the heating elements.

STOPPING A PROGRAM:

1. Pressing the red Stop S key will stop the program that is currently running. The red LEDs will go out and the display will show the current program number, approximate cycle time, and the current muffle temperature.

PROGRAMMING:

The furnace increases productivity and reliability for the operator because cycles or programs can be preprogrammed and operated automatically. Once programmed, the parameters are retained in memory even with the loss of power. Parameters are not retained in memory if entered during the operation of a program (experimental operation).

Each program is made up of 3 stages which contain 3 parameters each. The parameters are grouped into ramp rates (**R1, R2, R3**), temperatures (**T1, T2, T3**), and dwell or hold times (**H1, H2, H3**). The 1,2,3 indicates the stage number or sequence. The temperatures can be programmed in either °C or °F; the ramp rates in °C per minute or °F per minute; and the hold times in hours and minutes (hh:mm).

RAMP RATES (**R**) (0 - 40°C/minute)

1. Pressing the Rate key display's the current value of the R1 parameter followed by 3 blanks for a new value.
   - For example: R1 8.0°C/M ->_ _ _
   - The corresponding LED will also light to indicate the selected stage and parameter.
2. Use the digit keys (**0,1,2,...,9**) to enter the desired parameter value followed by the ENTER key. The new parameter is now stored in memory.
   - If a value is entered that is out of the acceptable range, the furnace will beep and display the acceptable range.
   - Programming a Rate to 0 will cause the furnace to terminate the remainder of the program stages. For example, if R2 is set to 0 then at the end of the first hold time (H1) the furnace will end the program, making the program a single stage.
3. Pressing the Rate key additional times gives access to the Rate parameters for the other two stages. The 4th time the key is pressed the display circulates back to the beginning and the R1 parameter will be displayed again.
   - The Rate key operates the same if pressed during the operation of a program with the following exception. The new Rate entered is used only for that one program or cycle and not stored in memory.
   - Negative ramp rates are also possible if slower than natural cooling.

TEMPERATURES (**T**) (50 - 1100°C or Tmax)

1. Pressing the Temp key makes the display show the current value of the T1 parameter followed by 4 blanks for a new value.
   - For example: T1 160°C ->_ _ _ _
   - The corresponding LED will also light to indicate the selected stage and parameter.
2. Use the digit keys (**0,1,2,...,9**) to enter the desired parameter value followed by the ENTER key. The new parameter is now stored in memory.
   - If a value is entered that is out of the acceptable range the furnace will beep and display the acceptable range.
3. Pressing the Temp key additional times will display and give access to the Temp parameters for the other two stages. The 4th time the key is pressed the display circulates back to the beginning and the T1 parameter will be displayed again.
   - The Temp key operates the same if pressed during the operation of a program with the following exception. Any new parameter entered is used only for that one program or cycle and not stored in memory.

HOLD TIMES (**H**) (0 - 99:59 mm:ss)

1. Pressing the Hold key display's the current value of the H1 parameter followed by 4 blanks for a new value.
   - For example: H1 1:00H ->_ _ : _ _ (1 hours and 00 minutes)
   - The corresponding LED will also light to indicate the selected stage and parameter.
2. Use the digit keys (**0,1,2,...,9**) to enter the desired parameter value up to 99 minutes and 59 seconds followed by the ENTER key. The new parameter is now stored in memory.
3. Pressing the Hold key additional times gives access to the Hold parameters for the other two stages. The 4th time the key is pressed the display circulates back to the beginning and the H1 parameter will be displayed again.
   - The Hold key operates the same if pressed during the operation of a program with the following exception. Any new parameter entered is used only for that one program or cycle and not stored in memory.

AIR EXCHANGE OPERATION

1. The air exchange operation is accomplished by using the venturi principle to draw air out of the muffle and into an exhaust air flow. The hot muffle air does not pass through the fan. Make up air for the muffle is introduced behind the muffle heating plates. This indirect air path causes the make up air to preheat before it reaches the muffle cavity to assure temperature uniformity.

2. The air exchange fan produces about 20CFM of flow when operated at full speed. The vent hood or system being used for the furnace should have sufficient capacity to accommodate this airflow.
3. The air exchange operation may be controlled for 10 different settings, ranging from 0 to 9 (off to full on). The maximum setting of 9 on the control performs approximate 5 air exchanges per minute. The curves shown on page 13 show approximate air changes vs. fan setting.
   Example: Stage 1 of program 5 can be programmed to a fan setting of 9 while stage 2 of program 5 can be programmed to a fan setting of 3 and stage 3 of program 5 to a fan setting of 0 (off).
4. The air control settings are retained in memory for each program even when the power is removed.
5. The air control settings are programmed into memory the same way as other parameters. Change to the program number of interest, press the key: once for stage 1, twice for stage 2 and three times for stage 3. The display shows the current fan level and a new level may be programmed.

A fan speed setting is changed and stored by pressing a digit key (0-9) followed by the ENTER key. A fan setting change made while a program is operating (running) is only used during that cycle and is not saved in permanent memory.

The higher the air control setting the slower the furnace will heat. High air control settings with low line voltages may prevent the furnace from reaching the maximum temperature.

PROGRAM 0

Program 0 is a single temperature hold program. The furnace will heat to this temperature and maintain it as long as power is applied.

1. Press the **0** key. The display shows the current programmed temperature and the 0 program number.
2. For example: T0 100°C -> _ _ _ _
3. Use the digit keys (**0,1,2,...9**) to enter the desired temperature followed by the ENTER key. The new parameter is now stored in memory. The display shows: 100°C ***** 0 where 100 is the current muffle temperature, 0 the program number, and ***** indicates that the program is not running.
4. Pressing the Start S key causes the furnace to heat at full power to the programmed temperature. The display shows "xxxx°C *Hold* 0" "xxxx" is the current muffle temperature, the word "Hold" indicates single stage operation and 0 indicates the program number. The T1 LED will also be on.

SPECIAL FEATURES

DELAY START (**D**)

The Delay Start function automatically starts a program so that it is completed at a selected time up to 7 days later. The delay is programmed in terms of delay days and completion time. A clock is used to keep track of time as long as the power switch is on. If a power outage should occur during a "Delay Start", the completion time will be delayed by the length of time the power was off (the clock stopped running).

Programming The Delay Start:

1. Pressing the Delay Start key shows the time of day and beep.
   - For example: Now=7:30->_ _:_ _
   - The corresponding LED will also light to indicate the Delay Start is selected.
2. Use the digit keys (**0,1,2,...,9**) to enter the current time of day followed by the ENTER key. The new parameter is now stored in memory. The time of day is entered as a 24 hour clock (11:34PM is 23:34), (8:10AM is 08:10).
   - Programming the current clock time "Now = 7:30 -> _ _:_ _" is only displayed and requested if there has been a power outage since the last time the Delay Start was operated. Turning the power switch off stops the clock.
3. Pressing the Delay Start key again shows the Delay D parameter in days.
   - For example: Day: 1 [1,2,...,7]
   - The corresponding LED will also light to indicate the Delay Start is selected.
4. Use the digit keys (**0,1,2,...,7**) to enter the desired number of delay days followed by the ENTER key. The new parameter is now stored in memory.
   - If a value is entered that is greater than 7, the furnace will display and use 7.
5. Pressing the Delay Start key again displays the desired program completion time. The furnace will calculate the approximate time that the program needs to start so that it is completed at this programmed time.

- For example: End = 14:30 -> _ _ :_ _
- The computer uses a 24 hour clock. Therefore, the completion time will be 2:30 PM.

6. Pressing the Delay Start key again shows the actual time (Now).
   - Pressing the key additional times will cycle through the other parameters. Press the Escape ESC key to stop the function.

Running A Delay Start Program:

1. Select the desired program number (See previous section on RUNNING A PROGRAM)
2. Press the Delay Start key to display the delay days.
3. Press the green start S key to start the delay timer.
   - The corresponding LED will also light to indicate the Delay Start is selected.
   - If the program run time is longer than the specified delay time the furnace will skip the delay and start the program immediately.

LINKING PROGRAMS

Programs can automatically run in sequence by using the Linking feature. With this method, a 6 stage (12 segment) program can be run automatically. Additional programs can also be linked as each program is completed.

Running Linked Programs:

1. Press the green Start S key with the first program to be run. The furnace will start operation.
2. Use the digit keys (**1,2,...,9**) to enter the next program number to be run followed by the ENTER ↵ key. The furnace will now run the first program followed automatically by the second. The program cycle time on the display will be the combination of the two programs. The display will alternately show the first program number and then the second program number.

CONTROL PANEL DESCRIPTION

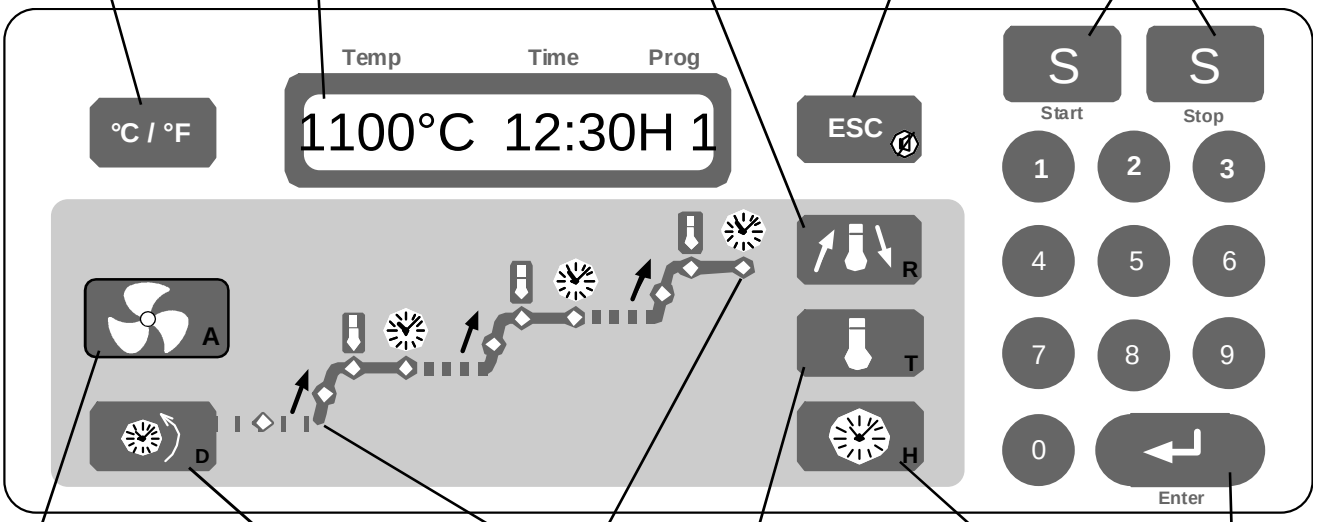
°C / °F changes the temperature from °C to °F and back. This key is not active when viewing parameters.

LCD Display displays the furnace muffle temperature, program count down time, and program number. During parameter programming the display shows the current value and new value for confirmation. It signals program operation by flashing the colon in the program time.

Rate key displays the current program's heat rates in degrees per minute. Press once for R1 (rate 1), twice for R2 (rate 2), and three times for R3 (rate 3). The corresponding LED lights and the current value is displayed. New parameter values can be stored in memory at this time followed by the ENTER key.

ESC (Escape) key cancels or aborts parameter programming by returning the control to the current conditions display. The display shows the current muffle temperature, program number, and program time or time remaining. This key also cancels the beeping at the end of the program.

Green **START** key starts current program. Red **STOP** key stops or aborts program if already operating. The red LEDs turn on when the cycle is started and are turned off as the program is completed. The display counts down the time remaining in the program during operation.



Air Control activates the air exchange feature for a chosen stage during a firing cycle. Press once for S1 (stage 1), twice for S2 (stage 2) and three times for S3 (stage 3). Press ENTER to stage new value. A setting of 0 means fan is off. A setting of 9 means maximum air exchange.

DELAY START activates the function that allows the furnace to automatically turn on at a later time and run a program. The delay time is programmed in the number of days and the time when the program is to be finished. The time is based on a 24 hour clock. Press this key once followed by the Start key to activate or start a delayed program and the LED will be turned on. Press this key several times to change the delay parameters.

Program Parameter LEDs indicate which parameters are activated and then completed as the program is running. All LEDs are turned on initially and then turned off as completed. During parameter programming the LED lights to indicate which parameter is currently selected. The LEDs do not light if a particular stage is turned off during that cycle.

Temperature key displays the current program's temperatures in degrees. Press once for T1 (temp 1), twice for T2 (temp 2), and three times for T3 (temp 3). The corresponding LED lights and the current value is displayed. New parameter values can be stored in memory at this time followed by the ENTER key.

Hold time key displays the current program's hold times in hours and minutes (hh:mm). Press once for H1 (hold 1), twice for H2 (hold 2), and three times for H3 (hold 3). The corresponding LED lights and the current value are displayed. New parameter values can be stored in memory at this time followed by the ENTER key.

Digit Keys are used to **CHANGE PROGRAMS** and enter new program parameters. **ENTER** key is used to store new program number or parameter in memory.

SPECIFICATIONS

PARAMETER

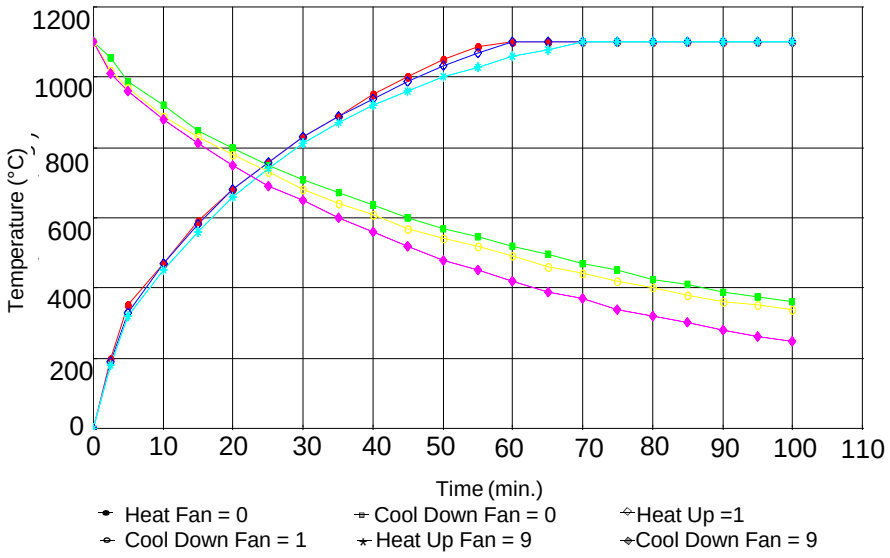
- Temperature Range: 50°C (122°F) - 1100°C (2012°F) / 1° Resolution
- Hold Time Range: 0:00 - 99:59 (hours:minutes) / 1 Min Resolution
- Ramp Rate Range: 0 - 40°C / minute (72°F) / 0.1°C Resolution
- Temperature Accuracy: ± 5°C (± 9°F) at steady state
- Muffle Temperature Uniformity: ± 8°C (± 15°F) at steady state

ELECTRICAL	**3-550A**	**3-1750A**
Voltage Nominal:	230V	230V
Voltage Range: @ 50/60Hz	200-240V	200-240V
Steady State Current: Amps @ 230V	9.6A	19.0A
Max Power Watts:	2204W	4370W
Watts to Maintain 1000°C: (Air Exchange setting @ 0)	1050W	2200W

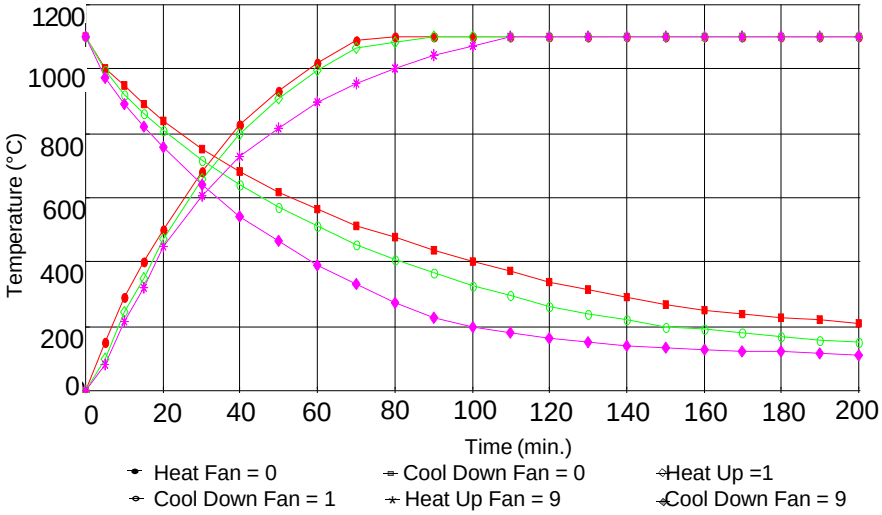
ENVIRONMENTAL

Ambient Operating Temperature: 5 - 40°C
Relative Humidity: Maximum 80%, non-condensing

3-550A PERFORMANCE CURVES



3-1750A PERFORMANCE CURVES



Test Conditions: Nominal line voltage, no load in the muffle only floor tray, full power applied to the muffle for the Heating Curve. The programmable rates are linear and fall below the heating curve and above the cooling curve (door closed) for some selections.

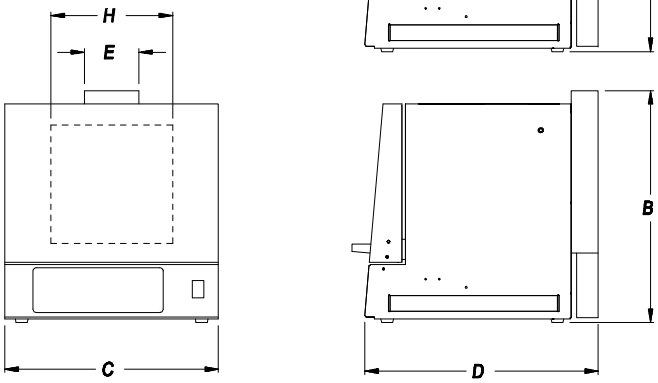
MECHANICAL OUTLINE DRAWING: mm(in)

Exterior Dimensions:

Model:	A	B	C	D	E	F
3-550A	635mm(25.0")	430mm(17.0")	400mm(15.8")	489mm(19.3")	100mm(4.0")	57mm(2.3")
3-1750A	807mm(31.8")	541(21.3")	572mm(22.5")	584mm(23.0")	100mm(4.0")	51mm(2.0")

Internal Muffle Dimensions:

Model:	G	H	I
3-550A	180mm(7.0")	230mm(9.0")	230mm(9.0")
3-1750A	274mm(10.8")	363mm(14.3")	325mm(12.8")



Model	Furnace Weight:	Shipping Weight:
3-550A	23kg(51lbs)	28kg(62lbs)
3-1750A	45kg(100lbs)	67kg(148lbs)

SETUP & MAINTENANCE

SETUP:

The Vulcan furnace goes through a self test that lasts approx. 6 seconds each time power is applied. After this test, the display will show the word "Setup?" for approximately 5 seconds. In the Setup mode, several different options are available for the user to select.

The first is the END OF PROGRAM operation which allows the user to select how the furnace should operate at the end of the program. The second is the Tmax parameter, a temperature alarm that can be programmed into the furnace. The last is TEMPERATURE ADJUSTMENT CALIBRATION (Tcal) which allows the user to alter the furnace temperature calibration.

1) Turn on power to the furnace. Press the ENTER ↵ key after the word "Setup?" is displayed and access to the Setup mode is gained.
   The END OF PROGRAM option is now displayed as "Hold = (1), (2),(3)". The **(1)** option is the factory default. It instructs the furnace to control the last programmed temperature, display "Hold" and beep every 3 seconds until the red Stop S key is pressed. Pressing the Escape ESC key will only stop the beeping.
   The **(2)** option instructs the furnace to control the last programmed temperature, and display "Hold" but without beeping until the red Stop S key is pressed.
   The **(3)** option instructs the furnace to turn the control off and let the muffle cool to room temperature. The display shows "End". The Stop key does not have to be pressed.
   Use the digit keys (**1,2,3**) to change the END OF PROGRAM option.
2) Pressing the ENTER ↵ key when the desired END OF PROGRAM is selected will store the entry into memory and then advance to Tmax the next option. The Tmax value limits the maximum temperatures that the furnace may be programmed to. The factory setting for Tmax is 1100°C. Use the digit keys (**0,1,2,...,9**) to enter the desired Tmax value followed by the ENTER ↵ key. The new Maximum Temperature is now stored in memory and the next option is displayed.
3) The final option is the temperature adjustment calibration displayed as "Tcal 1000°C->_ _:_ _". The factory setting for Tcal is 1000°C. Use the digit keys (**0,1,2,...,9**) to enter the desired Tcal value followed by the ENTER ↵ key. The new Temperature Calibration is now stored in memory. Entering a 1000 will return the furnace to the factory calibration. See the next section on Temperature Adjustment Calibration for specifics on how to determine a new adjustment number.

TEMPERATURE ADJUSTMENT CALIBRATION:

Every VULCAN furnace is calibrated in the factory at 1000°C. Under normal use the furnace should not require calibration. The electronics used in the VULCAN furnaces are very stable and will have minimal drifts over the life of the furnace. Thermocouple replacement could be a potential requirement for calibration if high accuracy is required.

This calibration can be altered by entering a new Tcal value in the Setup mode listed previously. The Tcal value has a range of 900 to 1100°C.

Example 1:

A program is operating at a steady temperature of 875°C and a separate thermocouple is inserted in the furnace and a digital thermometer is used to measure the muffle temperature. The display shows 875°C (the programmed temperature) but the digital thermometer reads 868°C. A new calibration value is calculated by dividing the displayed temperature (furnace) by the measured temperature (digital thermometer), the result is multiplied by the current Tcal value (factory default is 1000°C). In this case (875/868 = 1.008; 1.008 * 1000 = 1008). 1008 is now entered in as the Tcal value. With this method a furnace calibration can be done at any operating temperature.

Example 2:

Programmed temperature is 1050°C and the digital thermometer reads 1065°C. The previous Tcal value is 985°C.
(1050/1065 = 0.986 then 0.986 * 985 = 971)
971 should be entered as the new Tcal value.

CLEANING:

- Vacuum dust and dirt from the furnace rather than attempting to blow the dust off. This will minimize the amount of air born particles.
- Use a soft damp cloth to clean the control panel. Avoid excess water or solution when cleaning the furnace. These solutions can attack the panel or electronics and cause the furnace to malfunction.

TROUBLESHOOTING

ERROR CODES:

Err codes can be cleared from the display by turning the front panel power switch off and then on again.

Code	Description	Possible Cause
Err 1	Over Temperature	Temp > 1120°C, shorted thermocouple, shorted triac, shorted optotriac, wiring connections, computer PCB
Err 2	Open Thermocouple	Open TC tip, connection to TC, TC to (TC) PCB connection, computer PCB
Err 3	Temp > Tmax	Muffle temperature has exceeded the programmed limit temperature TMAX (see SETUP?).
Err 7	Brown-out	Low line voltage < 90VAC (<190VAC for 200-240V), wall socket shared with other loads, furnace connected with small extension cord
Err 8	EEPROM error	Parameter program memory error; computer PCB
Err 19	Line frequency	No line frequency detected, computer PCB

TROUBLESHOOTING THE VULCAN "3-" CONTROL

PROBLEM	CHECK LIST / CAUSES
Dead, Not Operating No Power / Display	- Check power receptacle or outlet for power - Check line or power cord connections - Turn on green power switch
Not Heating During Program Operation	Does the green power switch light when the Start key is pressed? No: - Is door completely closed? Door switch may be interrupting power. Yes: - Check the fuses on the controller PCB - Check heating element plates for continuity
Door Too Loose or Tight	- The amount of force or drag on the door movement can be changed by adjusting the hex screws located on the upper rear corners of the furnace cabinet. Turning the screw clockwise adds drag and requires more force
Heating Too Slow	- Rate programmed wrong. 1.5°/minute rather than 15.0°/minute - Large loads will slow down response time and increase the time to temperature by 2 to 5 times
Program Turns Off Too Early	- Programming a Rate to zero will terminate the remainder of the program - End of program option has been changed from 1 or 2 to option 3 which turns off the furnace at the end of the program [End].
Fan Does Not Operate	- Operates only in a start cycle - Setting of 0 means no fan active

ACCESSORIES

DESCRIPTION	PART NUMBER
Tongs; 25cm (10") Stainless Steel	9390014
Tongs; 30cm (12") Stainless Steel	9390015
Tongs; 36 cm (14") Plated Steel	9491010B
Tray- Bottom, Model 550	9353057
Tray- Bottom, Model 1750	9353060
Shelf - free standing, Model 550	9493327
Shelf - Model 1750	9493396
Muffle Hardening Agent	9491006
Temperature Pellets, Bottle of 25	
705 °C (1300 °F)	9490911
815 °C (1500 °F)	9490912A
Service Manual, Vulcan	9363049

PRODUCT SERVICE

Three methods of product service are available for the VULCAN. The first method is telephone assistance, available at the numbers listed below. The second is to return the furnace for servicing using the instructions below. The final method is to call DENTSPLY Neytech at the phone numbers below and obtain a service manual for a nominal fee.

BEFORE RETURNING THE FURNACE, DO THE FOLLOWING:

1. Remove all firing trays, shelves and other loose items from inside the muffle. Pack the muffle with the original foam block or newspapers to prevent shipping damage to the heating plates.
2. The original packing material should be used for the return shipment. Contact DENTSPLY Neytech for replacements if they are not available.
3. Call DENTSPLY Neytech for a RMA number (Return Material Authorization). This is used to track and identify your furnace. Material received without this number may not be identifiable.
4. Equipment damaged in shipment as the result of improper packing may not be repaired at the expense of the carrier. DENTSPLY Neytech. will not be responsible for damages resulting from improper packing.

Ship Prepaid To:
909-795-2461
FAX 909-795-5268

DENTSPLY Neytech
RMA Number _____
13553 Calimesa Blvd.
Yucaipa, CA 92399-2398 USA

WARRANTY

WARRANTY: Except with respect to those component parts and uses which are herein after described, DENTSPLY Neytech warrants this furnace to be free from defects in material and workmanship for a period of two years from the date of sale. DENTSPLY Neytech's liability under this warranty is limited solely to repairing or, at DENTSPLY Neytech's option, replacing those products included within the warranty which are returned to DENTSPLY Neytech within the applicable warranty period (with shipping charges prepaid), and which are determined by DENTSPLY Neytech to be defective. This warranty shall not apply to any product which has been subject to misuse; negligence; or accident; or misapplied; or modified; or repaired by unauthorized persons; or improperly installed.

INSPECTION: Buyer shall inspect the product upon receipt. The buyer shall notify DENTSPLY Neytech in writing of any claims of defects in material and workmanship within thirty days after the buyer discovers or should have discovered the facts upon which such a claim is based. Failure of the buyer to give written notice of such a claim within this time period shall be deemed to be a waiver of such claim.

DISCLAIMER: The provisions herein state DENTSPLY Neytech's sole obligations and exclude all other remedies or warranties, expressed or implied, including those related to *MERCHANT-ABILITY* and *FITNESS FOR A PARTICULAR PURPOSE*.

LIMITATION OF LIABILITY: Under no circumstances shall DENTSPLY Neytech be liable to the buyer for any incidental, consequential or special damages, losses or expenses.

LIMITATION OF ACTIONS: The buyer must initiate any action with respect to claims under the warranty described in the first paragraph within one year after the cause of action has accrued.